AGRICULTURAL NEWS LETTER

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This publication contains information regarding new developments of interest to agriculture based on laboratory and field investigations by the Du Pont Company. It also contains published reports of investigators at agricultural experiment stations and other institutions as related to the Company's products and other subjects of agricultural interest.

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AGRICULTURAL NEWS LETTER

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THE AGRICULTURAL NEWS LETTER serves as a medium of reporting new developments and ideas in agriculture, particularly those related to advancements through research. Material herein may be reprinted in whole or in part, in the interest of advancing the general knowledge of new agricultural practices.

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THE NEW "NON-CONFORMITY"

Yanking weeds is still, on most of the world's croplands, an exhausting task requiring steel-tendoned fingers and rubber-muscled backs. By contrast, those countries with high standards of living, such as the United States, have developed a growing variety of tools and techniques for blitzing weeds. Cultivators long ago outpaced the hand hoe and, in recent years, special chemicals like Du Pont "Karmex" monuron and diuron herbicides have wilted unwanted vegetation without rustling the dirt.

This variety in the art of killing weeds is a homely but telling symbol of the general richness of life in America today. For if there is one characteristic more than any other which marks life in a highly civilized society it is the immense variety of ways to do things — whether at work or at play. Nothing compels conformity so much as a static economy; nothing liberates the imagination or the actions of men so much as a competitive economy which restlessly seeks better methods and better materials for all the tasks of life.

Under the impetus of our burgeoning postwar economy, millions of Americans have taken up such sports as fishing, golf, bowling, waterskiing, and watching the trotters go at the local half-mile track. Bug-like foreign sport cars have multiplied, and small city symphony orchestras have flourished. King Cotton has migrated west, and beef cattle now roam the South. Young folks think nothing of leaving the sidewalks of eastern cities to hunt down jobs near the California beaches. And every winter old folks from 30 frost-bitten states play shuffleboard in colonies around St. Pete, instead of stoking up the furnace at home and drawing on an extra suit of woolies.

Even life in the industrial corporation — reputed to be arch-conservative and ultra-orthodox — presents fewer and fewer set patterns today by which people can pursue success. Engineers may become salesmen; production foremen may become training supervisors; and research scientists may end up as company presidents. Contrary to popular notions created by Broadway and Hollywood, the grey flannel suit and hand-painted cravat are lost in a welter of worsteds and plaids, of saucy bow ties, and, where practicable, open collars.

For the farmer, too, routines of centuries are fast disappearing. Vast regions no longer hang upon the fate of one crop. Farm families dress with as much style and variety as city folk, enjoy as great a range of entertainment, and benefit from equal opportunities for education.

In truth, today the "typical" industrialist, the "typical" office clerk, the "typical" collegian, and the "typical" farm boy are fast disappearing from the scene, weeded out by an economic growth and progress that permits every individual to develop his own personality and live in his own style.

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Weed Control Raises Alfalfa Yield and Quality

By MILLARD C. SWINGLE
Grasselli Chemicals Department
E. I. DuPont de Nemours and Co.

Better yields of top-quality alfalfa are in prospect for many parts of the country on the basis of field trials in 23 states which are demonstrating the value of selective weed control with diuron herbicide. Commercial registration for the Pacific Northwest followed several years of testing in established alfalfa fields of Oregon, Washington, Nevada, and Northern California, where the crop goes dormant during winter months. This work, using Du Pont "Karmex" DW diuron herbicide, was carried on by state colleges, county agricultural agents, leading growers, and the Du Pont Company.

Further Use In Prospect

Tests have been carried on in other parts of the country as a basis for recommending use of the product in other areas. During the 1957 growing season, supervised grower trials have been conducted in parts of California where the crop does not go completely dormant, as well as in mild areas of western Oregon. The prospect of extending use of diuron into other areas is based largely on successful results achieved in New England, and the Middle Atlantic States, Arkansas, Indiana, Utah, Montana, West Virginia, and Arizona. Diuron has given excellent control of such annual weeds as cheat grass, wild barley (foxtail), rye grasses, brome grass, wild mustard, shepherd's purse, chickweed, and pepper grass. Weeds reduce hay quality and often cause marked yield reduction.

Yield Increases Proportionately

Field observations have shown about 95 per cent control of annual weeds, without injury to the alfalfa crop. Yield has increased virtually in direct proportion to weed reduction, with a clean plot yielding as much hay as the total previous weight in alfalfa plus weeds. In some of the treated plots the crop was taller than in untreated control plots. Sample cuttings from treated areas showed a 92 per cent reduction (wet weight) of weed content, perennials accounted for the remaining weeds.

Samples of seed from treated alfalfa showed no harmful effects on germination and there has been no indication of phytotoxicity to alfalfa or alfalfa-clover mixtures when recommended dosage was applied. Alfalfa fields which are being replanted or reseeded with grain or other seed-planted crops should not, however, be treated with diuron within the 12 months prior to this operation.

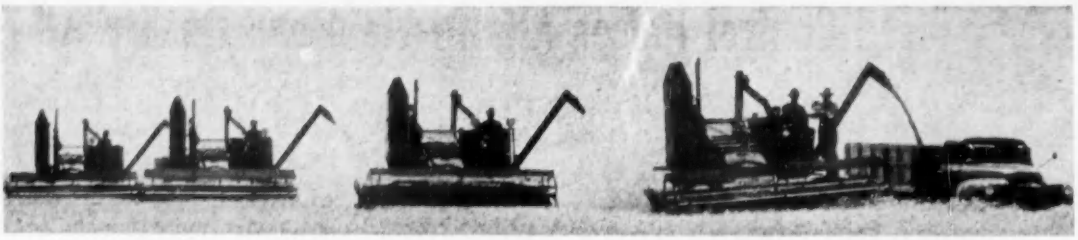
Trial Is Recommended

A tolerance of two parts per million for diuron on alfalfa has been established by the Food and Drug Administration.

Since relatively few growers have had experience with use of herbicides on alfalfa, initial trial use on limited areas is advisable. Proposed application rates range from one pound per acre in Pennsylvania, Maryland, and Virginia up to three pounds per acre for areas west of the Appalachian Mountains where alfalfa goes dormant. In Washingon and Oregon, the preferred application period is betwen the middle of October and the middle of December, while January treatment may be made in Nevada and in the Oregon - California border area. In the Northeast, successful trials have been made in the fall after the alfalfa became dormant. In the Mid-west, application in the spring is preferred.

Water Carries Diuron Into Soil

"Karmex" DW usually is applied to alfalfa in 40 gallons of water per acre to assure even distribution and proper coverage. The low rate suggested is usually effective against most germinating weed seeds and small seedlings, but may not control well-established weeds, especially deep-rooted perennials. Rainfall or irrigation is required to carry diuron into the soil where it is taken up by the root system. Best results occur if the herbicide is moved by moisture into the upper layer of soil within the first two weeks of application.



Function Determines Size of Farm and Business

Few farmers would dream of raising wheat n a field the size of a potato patch, or rice on the average plot for green beans. Nor would a modern corporation try to make cars in a service-station garage or industrial chemicals on a drug store prescription counter.

The obvious reason is that in most areas of economic activity, the size of the producing unit is determined by the product it makes and the size of the market it serves. When the investment is large, the operation complex, and the market large, chances are that the operating unit, too, will be large — like steel plants or wheat fields.

If the operation requires relatively little investment, can be done by small numbers of workers, or serves a limited market, the unit is usually a little one. The corner gas station or the average cucumber field are examples.

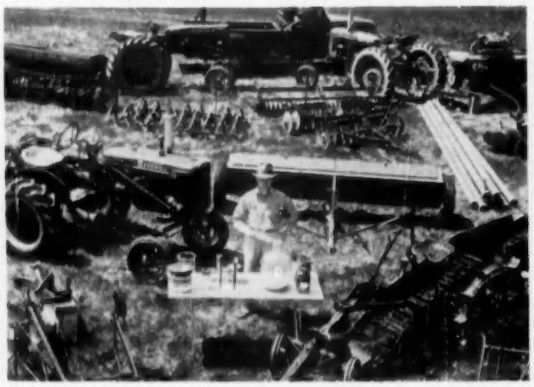
As pointed out in a joint report* on wheat production by the Commerce and Agriculture Departments: "The size of business is important in wheat farming as it is in all phases of agriculture and in business outside the field of agriculture. A first requirement of high returns in mechanized agriculture is a volume business large enough for effective use of machinery and labor resources."

The acreage and investment in wheat farming reflect this principle. The average U. S. acreage devoted to wheat is 62 acres, the second highest of any crop. The average cash-grain farmer has an investment of $45,000 to $70,000 in his farm, as compared to the national average of $26,000. Since the national average includes a wide range of farms, including many small eastern wheat units, the average is not wholly representative of the typical wheat-region operation. In the major wheat regions, it is several times the U. S. average.

The highest figures for average acreage are in the field crops, such as grains, cotton, and forage. Vegetables, in general, are on the other end of the scale.

Topping the list is rice, with an average of 213 acres per farm. One of the major factors in determining the high average is the practice of flooding rice fields, which requires a substantial investment in irrigation facilities. As in the case of machines, irrigation installa-

*U. S. Bureau of the Census. U. S. CENSUS OF AGRICULTURE: 1954. VOL. III, Special Reports Part 9, Farmers and Farm Production in the United States. Chapter I, Wheat Producers and Wheat Production, U. S. Government Printing Office, Washington 25, D. C., 1956.



SIZE OF FARM is often determined by type of crop grown and quantity of machinery needed for efficient, economical operation.

HIGH INVESTMENT in operating facilities, such as irrigation systems, is important factor in raising average size of farm.

tions usually become more economical with increasing farm size. An Agriculture Department study of the relationship of irrigation costs and farm size showed the cost per acre to be $500 on farms under 10 acres, but only $159 on farms of 30-49 acres, while the cost dropped to $70 for 200 to 499 acres.

Among the other large-acreage crops are oats (27.0 acres), soybeans (29.0), sorghums (47.8), barley (39.2). In fact, none of the common field crops with total national acreage of over two million has an average of less than 21 acres, whereas only two of those with total acreage of under two million are in that group: alfalfa (24.0) and sugar beets (34.7).

Same Factors In Industry

Among the common vegetable crops, the highest average is 23.4 for lettuce, a crop which requires substantial labor investment in the major growing area, California. Next are green peas (16.9 acres), asparagus (14.8), and celery (13.6). The majority are under 10, many in the range of 2 to 4 acres average.

Incidentally, the national average for potatoes is 0.8 and for green beans, 0.9 acres.*

**Although such national averages are not necessarily typical of commercial farms, they do provide a measure of relative size.*

This type of functional grouping is also characteristic of industry. Comparisons of the assets and per job investment of business firms show that there is a definite relationship betwen size and function. Among the nation's 25 biggest companies, there are three of the four major automobile makers, eight oil companies, three steel companies, three electrical manufacturers, and three packers or food processors. All of these require major investments in productive facilities to supply today's mass market with low-priced products.

Evidence On Local Level

Even the smallest of the major automobile makers (American Motors) has assets of $225 million. The Pittsburgh Steel Company is 15th on the list of steel makers, but its assets total $159 million. In shoe making, which does not require the investment of steel, the largest company has about $70 million invested, and the largest watchmaker, but $55 million.

The relationship is just as evident on the local level. The largest department store usually has greater investment than the largest gasoline station, which, in turn has more in assets than the largest barber shop. In each case the average size is dependent on the job to be done and the market to be served.

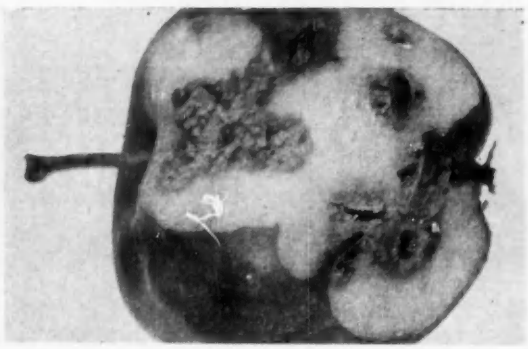
Fertilizer Raises Range Output

Fertilized range pastures produced more than twice as much feed as unfertilized areas last year at the University of California Hopland Field Station. Also, the plants in the fertilized pastures produced much more feed during December and January than those in unfertilized plots. This increased forage production at a time when there is very little feed on native ranges made it possible to feed more sheep during the winter period.

By the end of January of the 1955-56 winter period, the fertilized pastures had produced about 1,100 pounds of dry forage per acre. Growth continued slowly until the middle of March, when it jumped sharply. By late May, 4,300 pounds of forage had been produced. In the unfertilized pastures, forage production was nearly stable at 250 pounds per acre during December and January. Then it increased slowly so that by the middle of March nearly 500 pounds per acre had been produced. By the end of May, this area had produced about 2000 pounds per acre.

"The growth pattern on the unfertilized range appears to be closely related to temperature, since there was ample soil moisture during this period." Soil microorganisms, which break down the soil organic matter, are not very active at temperatures of 40 degrees or below. This limits the availability of mineral constituents, such as nitrogen and phosphorus, which are mainly derived from the breakdown of organic matter. The average temperatures at the Hopland station were 41 degrees for January, 1956; 40 degrees for February; and 46 degrees for March. Fall applications of nitrogen and phosphorus provided enough of these elements for plant growth during the cool period of the year. — UNIVERSITY OF CALIFORNIA.

Thiram Controls Ten Apple Diseases



THIRAM APPLICATION controls ten diseases of apples, including apple scab, right, world's greatest threat to yield and quality.

By JOSEPH A. EVANS, Ph. D.
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Ten diseases of apples, including eight which occur in midsummer or late in the growing season, can be controlled with thiram fungicide — more than can be controlled with any other commonly used fungicide, according to a compilation of 36 orchard trials in 15 states. The list includes apple scab, cedar-apple rust, and eight diseases which damage the quality of fruit for market and storage, including black rot of fruit and foliage, fly speck, sooty blotch, Botryosphaeria spot, and black pox. Some of these diseases cause damage to the trees themselves.

Thiram fungicide is manufactured by the Du Pont Company under the trade name "Thylate." Applications of 1½ to 2 pounds per 100 gallons of water as a spray, on a schedule which controls apple scab, generally controls the other nine diseases as well. Thiram as a dust is being tried commercially in New England this year.

"Thylate", a light-colored fungicide, has given outstanding fruit finish in field tests. It is a protective fungicide and applications are most effective in advance of infection periods. The field tests on which commercial recommendations are based have been conducted both by state experiment stations and by company technical representatives working with commercial growers.

Rain Promotes Scab

Apple scab, long considered the world's greatest threat to full yield of high quality crops, overwinters in fallen leaves and infects new growth in the spring, damaging leaves, and fruit. Rainy weather which aids vigorous tree growth also favors development of scab infection. Some of the early chemical fungicides which were used to control the disease had injurious effects on both fruit and foliage.

Cedar-apple rust produces yellow to orange lesions on the leaves and fruit of apples and spends almost two years of its life cycle on red cedar trees. Cedar leaves may be infected in July and August by spores blown from diseased apple trees. The disease may then spread to other apple trees during the next two spring seasons. Spring rains, followed by a decrease in humidity, favor development and spread of the infection. Rust spots appear on apple leaves within one to three weeks, depending on temperature and susceptibility of the variety.

Disease Destroys Apple Pulp

Blotch has been found in all apple sections east of the Rockies, but is most troublesome in southern orchards. It attacks leaves, fruit, and the current season's twig growth. The fungus remains alive in twig cankers for at least three years, and is most likely to infect fruit early in the season.

Bitter rot, a destructive warm-weather, midsummer disease caused by the fungus **Glomerella cingulata**, occurs in Maryland, Virginia, West Virginia, and Arkansas and southern Illinois, Indiana and Missouri. It may also appear elsewhere when temperatures are over 70 degrees with abundant rain. Fruit infections rarely appear before June, and continue through early September. The fungus filaments penetrate the skin, kill the individual cells of the apple pulp, and cause a breakdown or rot of

the tissue. It is sometimes confused with black rot, but is generally more watery. Infected apples frequently remain on the trees, shriveling into hard masses called mummies, where the disease over-winters to infect the new crop.

Sooty blotch and fly speck mar the eye-appeal of fruit. Although they are caused by two different fungi, they are often found together. Both thrive with high humidity and poor air drainage. Infection may occur from mid-June to September.

Damage To Limbs and Foliage

The chief damage of black rot is to foliage and limbs, but it may infect the fruit in midseason and go unnoticed until harvest. On the limbs it is called black-rot canker and New York apple tree canker; on the fruit, black rot, blossom end rot, and brown rot; on the foliage, frog-eye, or as leaf spot and brown rot.

Brooks spot, also known as Phoma fruitspot, is found mostly in the East as deep red or black spots on red areas of fruit, and dark green on lighter surfaces. The spots may be inconspicuous at picking time, but if the fruit is not placed in cold storage at once, they usually enlarge and become sunken, developing a corky layer under the skin. It is sometimes confused with bitter pit or Stippen, a fruitspot caused by sudden changes in the water supply of the tree. One difference may be seen at picking time when the Brooks spots show black specks which are not present in Stippen.

Black Spots on Fruit

Black pox is one of the summer fruit rots which may be serious in milder climates, especially southern Indiana. It appears during July or August as sunken black spots on the surface of the fruit. It has been found in Georgia on the woody part of the tree as small purple pimples or papules, dark colored sunken areas, and scaly small lesions of dead bark in older infections, resulting in dead limbs or trees.

Botryosphaeria is an especially costly fruit rot which has been found throughout Indiana and eastward. Fruit that appears sound when harvested rots rapidly at room temperature. It has been suggested that infections may take place in summer and remain latent until the fruits approach or attain maturity. In contrast to many other fungus diseases, this one apears to be favored by drought. Besides the fruit damage, the disease has also done serious damage to the scaffold limbs of previously highly productive trees of susceptible varieties.

Leading Stars Featured In New Du Pont TV Series

The intriguing tale by Mark Twain of what happened to a young prince and a pauper who changed clothes and places will be told on the "Du Pont Show of the Month," October 28, at 9:30 p. m. EST over the CBS network. Based on Twain's classic adventure story, "The Prince and the Pauper," the production will be the second in a new series of 90-minute TV shows being presented by Du Pont.

Already slated for future production are a musical adaptation of "Junior Miss" and a musical production of "Aladdin", with script by S. J. Perelman. The series, which includes a total of 10 shows featuring leading stars of the entertainment world, will be the most ambitious in the company's history. It will include many types of entertainment, including comedy, drama, and musicals.

The new show replaces "Cavalcade of America," a Du Pont radio and TV feature for 22 years. "Cavalcade" scripts — whose theme was America, its history, people, and achievements — were produced by many of the nation's best-known writers, including Carl Sandburg, Louis Bromfield, and Stephen Vincent Benet. Generations of school children saw and heard history come to life through "Cavalcade."

NITROGEN MAKES BETTER PEACHES

Elberta peach trees that had a high nitrogen content in their leaves produced high quality canned fruit with good color and texture. By contrast, low nitrogen peaches were sour, fibrous, soft, and frequently unpalatable when canned, even though they had been firm and attractive when fresh. High nitrogen fruit also retained their shape much better than low nitrogen peaches when steam was applied before peeling. — WASHINGTON STATE COLLEGE.

CHEMOTHERAPY OF PARASITIC CHEMISTRY

By D. C. BOUGHTON and C. O. PRICKETT
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Half a century of research on viruses has shown that they — like bacteria, fungi, and animal parasites — are responsible for a variety of economically important diseases of plants and animals. In 1935, Stanley separated one of the plant viruses from its host in the form of chemical crystals. Research since then has added much valuable information on the chemical nature and biological behavior of these pathogenic agents. The opportunities for control of virus diseases by chemicals are being reappraised in the light of this new knowledge.

One of the most striking features of viruses is that they are wholly parasitic. They can grow and multiply only within living cells of specific hosts. Outside their host cells, viruses are inept and, presumably, readily frustrated.

Indeed, the parasitism practiced by viruses is of the most intimate type conceivable. Immediately after penetrating a host cell, a virus particle loses its identity, and the chemical reactions constituting its growth and reproduction become inseparable from the chemical reactions of the living processes of its host. The end product of this parasitic chemistry is a swarm of new virus particles. Each is exactly like the invading particle that initiated the chemical interplay between parasite and host. As a result of virus reproduction the host cell may suffer damage or be completely destroyed. The latter is strikingly illustrated in the case of certain viruses of bacteria (bacteriophages), in which the infected bacteria are burst assunder as if by pressure from within.

Viral Disease

Viral disease is the result of an overwhelming reproduction of virus particles. Successive generations of an infecting virus invade and destroy progressively more and more cells of the tissues for which it has special affinity, to an extent eventually damaging to the well being of the host as a whole. The multiplication, potentially unlimited, will be checked only when the supply of susceptible living host cells runs low or when the infected host rallies sufficient immunological response. Under natural conditions, the host usually suffers considerable damage before an effective immunity can be developed. Secondary invasion by bacteria is often a complicating factor, the symptoms and pathologic effects ascribed to viral disease being in reality due to mixed infection. Beneficial results have been obtained from the use of antisera, antitoxins, and antigens aimed at the virus and from chemotherapeutic agents effective against secondary invaders.

Synthetic Viruses Created

Recent studies on the chemical anatomy of viruses suggest that research in pure chemistry may be particularly rewarding in developing means of controlling the viruses themselves. For example, it has been shown that several viruses consist of a central core of nucleic acid and an outer sheath of protein. These two parts can be separated and studied individually. In ingenious experiments the cores and sheaths of viruses belonging to several strains have been manipulated at will and tested in various combinations. Synthetic viruses have been created in which the core was derived from one natural strain and the sheath from another. It has been shown that the core governs reproduction and heredity and that the sheath possesses the immunological properties. These functional parts of virus structure now are targets for chemical attack.

Methods of Chemical Control

The chemotherapeutic approach to control of virus diseases is, however, still blocked: Not only by obstacles encountered in disease due to any obligatory cellular parasite but also by a special difficulty deriving from the unique interlocking of virus and host. Chemical at-

tack against a parasite obliged to find a host cell can be directed at the parasite before it enters, while it is in, or after it leaves the cell. Control by chemical modification of the host cell can be aimed at rendering the cell resistant to initial entry or subsequent development of the parasite. In the latter case, theoretically, the resistance could take the form of an extreme susceptibility on the part of invaded cells, the early death of which would then preclude multiplication of the parasite.

Disease due to cellular parasites presents one of Mother Nature's disconcerting paradoxes: In an organism capable of fighting off a parasite attack by an eventual immune response, the cells initially attacked are permitted to cooperate with the invader by serving as safe centers for parasitic mobilization against the organism as a whole. The cell is traitor to the body of which it is a part. All successful cellular parasites (such as viruses and coccidia) have evolved working agreements with the host cells of their choice. The latter permit penetration of the parasite and provide the shelter and sustenance needed for its growth and multiplication.

Parasite Induces Cell Change

For example, host cells for some of the coccidia obligingly increase enormously in size when parasitized, as if to accommodate their growing guests. These giant host cells possess enlarged but otherwise normal-appearing nuclei and cytoplasm for at least two weeks after entrance of the parasite. The latter maintains its identity (as a recognizable coccidium) all the while it is in the cell. The presence of the parasite induces a demonstrable change in the cell, presumably favorable to the parasite. (In this instance the parasite promotes growth!)

Host cells of viruses are also accommodating to their invaders. They permit the virus to usurp their own metabolism. They permit the intimate intermingling of virus and their own protoplasm that results in a distinct type of metabolism governed by two sets of hereditary factors, one belonging to the virus and the other to the cell. (This ultimate in compatability has tempted some workers to suggest that viruses may have originated from ancestors of the very cells now serving as their hosts.)

The classic problem in chemotherapy is to suppress effectively or, preferably in some cases, to destroy completely the infective agent with dosages of drugs that are harmless to the infected host. With viruses the problem presents a special challenge: In their active phase, these disease agents exist only as chemical reactions in the metabolism of infected host cells. The latter remain alive at least long enough for the virus to complete the parasitic chemistry necessary for reproduction. The presumption is that the dual metabolism of an infected host cell is quite similiar to that of an uninfected, normal one. The hope for chemotherapy is that significant differences may make it vulnerable to chemicals harmless to normal metabolism.

Selective Effect Of Drugs

A chemical with selective killing action against infected cells in the early phase of virus-cell metabolism would be a good antiviral agent. Of course, as mentioned, it would have to be relatively harmless to normal cells. Infected cells are obviously expendable in the incubative period of virus disease. Their destruction prior to virus multiplication would forestall disease development in the host animal or the host plant.

Therapy by chemical activity against infected cells would differ only in mechanism of action from treatment by selective activity against the pathogens **per se.** Presumably opportunities for the latter are enhanced when marked fundamental differences between host and parasite exist, as between calves and coccidia. The suppressive effect of sulfa drugs in coccidiosis is attributed to selective action agains coccidia within host cells. The evidence for this is that the parasites are affected but uninfected host cells are not. (Theoretically, however, the drugs could affect parasitized cells adversely and thus indirectly the parasites within them).

The fundamental similarities of viruses and their host cells, on the other hand, suggest that selective action against viruses may be harder to find than in the case of protozoan diseases. Attention is focused upon the virus-cell complex. This target closely resembles normal metabolism, which we dare not hit. We must first see it clearly and then take dead aim.

new PRODUCTS AND APPLICATIONS

Portable coated nylon tents have demonstrated their efficiency for grain storage purposes to the farm owner as well as to mills and other processors. Coated with neoprene, the nylon wall and floor are fabricated into one unit and stitched with a French chain-lock seam so that the grain never touches the ground. All seams are cemented for waterproofness and two years of rugged field testing showed endurance for all types of weather, including winds up to 150 miles per hour. (Manufactured by Savage Mills, Inc., Brooklyn, N. Y.)

* * * *

Fifty per cent more tensile strength is provided by two improved types of electrical insulation tapes. The web of "Dacron" polyester fiber combines advantages of very low moisture absorbency, superior varnish pickup and heat resistance, good di-electric properties, and greater conformability than conventional cotton, glass, or synthetic cloths previously used. Tapes can be used by the farm handyman in applications requiring considerable strength and on automatic taping machines. (Made by Minnesota Mining and Manufacturing Co., Minneapolis, Minn.)

* * * *

Work shoes and gloves have longer life even under the roughest farm conditions when leather is processed with Du Pont "Quilon" chrome complex. This treatment, which lasts for the life of the leather, provides protection under adverse conditions for both shoes and gloves by resisting shrinkage, rigidity, and other discomforts. Many manufacturers of gloves and safety shoes, work shoes, hunting, hiking, and sports shoes have added styles to their lines which utilize this process of improving leather products.

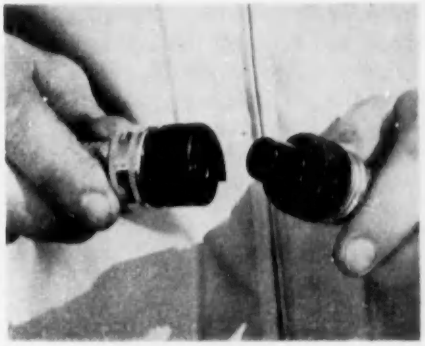
* * * *

The first boys' lined, fall-weight jacket in "automatic wash-and-wear" construction will be of special interest to the farm housewife. The jacket has a whipcord outershell of 65 per cent "Dacron" polyester fiber blended with rayon and pile lining of "Orlon" acrylic fiber. With moderate heating as in the home drying machine, molecules within "Dacron" polyester fiber return to their normal position from which they are forced when the fabric is wrinkled in wear and washing. Special tailoring techniques permit the coat to withstand washer cycles. (Made by Mighty-Mac, New York, N. Y.

Nonflammable solvents that will bite into and remove oil, grease, and dirt without harming delicate metal parts or electrical insulation, yet are safe enough to use in ordinary work areas with conventional ventilating equipment, are now available to solve a wide range of special industrial cleaning problems. These solvents are sold by Du Pont under its "Freon" trademark in container sizes ranging from 10 to 55 gallons.

* * * * *

Farmers who use many hose attachments can shorten the time and effort utilized in splicing and coupling with a new coupler designed for a simple change-over. Besides saving time, the coupling gives an improved seal which will not leak from loosening during use. It is unaffected by variations in water temperature, garden sprays, insecticides, detergents, cleaning solutions, oil, or grease. Du Pont makes the "Zytel" nylon resin used in these couplers. (Manufactured by Stile-Craft Mfg. Co., St. Louis, Missouri.)



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Flexible urethane foam has taken on a new use in making farm produce attractive to consumers - that of banding vegetables and fruit for display. The foam is made into a colorful band that is economical and protects the fruit from damage. Approximately an inch wide, it snaps over the item, whether lettuce or a bunch of asparagus. The softness prevents cutting and damage when shipped or handled by the shopper. Du Pont makes the isocyanate, a basic ingredient of urethane foam. (Manufactured by H. R. Denton Co., Berkeley, Calif.)

* * * *

Cotton work clothes will wear an average of 70 per cent longer, at only 25 per cent higher cost, when made of a fabric fortified with new "Du Pont" 420 nylon. In one wear test of fortified denim work clothing, a group of workers wore work pants fortified with 420 nylon and all-cotton pants of the same weight and construction on alternate weeks. Nylon-fortified pants (B) wore an average of 229 days, compared to an average of 134 days for all cotton pants (A). Longer wear life will mean sizeable savings to the work clothes wearer.

Weed Control In Tobacco Plant Beds

By R. P. HOLDSWORTH, JR., Ph. D.
Grasselli Chemicals Department
E. I. du Pont de Nemours & Co., (Inc.)

Tobacco is a rugged plant just before harvest, but it starts out as a very frail plant from seed as fine as dust. Just one ounce of seed furnishes enough plants for one acre of tobacco. The seed is distributed evenly* in a plant bed area of 100 square yards with the surface raised about six inches above the level of the surrounding ground by means of logs or planks. During the fall, the plant bed is worked to a depth of about six to eight inches, raked smooth and then fertilized.

Common weeds are the major enemies in the production of tobacco plants and one of the principal problems is to keep the bed sufficiently weed-free so that enough plants of the right size are available to the farmer at transplanting time. Farmers usually try to grow more plants than needed, but, even so, failures often make it necessary to purchase plants from others.

Farmers can either attempt to kill weeds in the fall or wait until early winter — or even early spring — to put weed-control measures into effect. The most commonly used method is burning. The surface of the plant bed is covered with old cotton stalks or dry branches and set afire. Burning gives unreliable results. Heat does not readily penetrate downward and many weeds survive. Too heavy a blanket of ashes can raise the soil pH to the point where it affects plant population and growth.

Control With VPM Effective

Some growers use fertilizer components that act on germinating weed seeds in the spring following a fall application. The success of this method depends on adequate rainfall and, in general, results are best following a wet fall and winter.

More recently, methyl bromide has been used for weed control. This method requires a gas-tight cover — usually made of plastic — rigged over the bed like a shallow tent. The gas is introduced through plastic tubing from small pressurized cans. Although generally used shortly before seeding in the spring, methyl bromide may be applied in the fall as well. This system gives good results. The most careful attention must be given the arrangement of the cover so the area is airtight.

Experiments last year showed that effective tobacco-bed weed control can be achieved with a water drench of sodium methyldithiocarbamate (VPM fumigant). This product has been registered for use in Florida, Georgia, South Carolina, Virginia, Tennessee, and Kentucky.

Chemical Permeates Soil

VPM represents a departure from other methods of weed control. When applied to the plant bed as directed, the sodium methyldithiocarbamate is hydrolyzed in the presence of traces of heavy metal in the soil. Thus, methylisothiocyanate, a volatile gas, is generated and permeates the soil, killing weed seeds, as well as roots, corms, and other vegetative forms of perennial plants at the treated depth. Some wild clovers, hard coated seeds, may survive. These and other small number of weeds that may sprout later can be pulled without the back-breaking labor long associated with hand weeding alone.

VPM should be applied in the fall, following rain when the soil is at planting moisture to a depth of six to eight inches.

A concentration of nine quarts fumigant to 100 gallons of water can be distributed over the plant bed by a pump connected to a trac-

WEEDS CHOKE UP untreated tobacco plant bed, foreground, while area treated with VPM is clear for planting crop.

**In order to sow an ounce of this fine seed evenly over the plant-bed area, it is mixed with sand and scattered. It may then be lightly raked.*

tor power take-off or by use of a sprinkling can with enlarged holes. After application, another 100 gallons of water should be immediately distributed over the bed to further carry the chemical into the soil and to serve as a seal.

The advantages of VPM application include the following: (1) Weeds can be controlled in the fall when there is more time to choose a proper day for teatment, (2) many beds can be treated in a single working day, (3) the method is relatively simple and convenient, and (4) no gas-tight covers required.

North Carolina is not yet recommending VPM because of the possibility of injury to plants in the heavy clay loam soils of the state. Research studies by Du Pont have demonstrated that adequate weed control in this type of soil can be achieved with half the usual recommended concentration, without injury to the tobacco crop. Experiments will have to be repeated before VPM can be recommended for use at reduced dosages.

Managing Game Nature's Way

"Wildlife management can mean doing a little in place of doing a whole lot. Sometimes leaning easy on the hoe will produce results as gratifying as what comes from a lot of plowing, fertilizing and planting." So reports Dr. J. P. Linduska, Director of Wildlife Management from Remington Farms, Chestertown, Md., operated by the Remington Arms Co.

"All too frequently," Linduska adds, "our concepts of game management take on an artificial flavor. We think nature has to be subdued, and her ways replaced by our own devices, in order to do the job right. But, in many cases, working with natural forces, and maybe steering them a little, can pay off handsomely in benefits to game. Here at Remington Farms we're doing a little of both.

Seeds Provide Food

"On one pond we did nothing more than drain the water off in June. And in August, you could hide a cow in the volunteer stand of millet, smartweed, and other prime duck foods. On a couple of idle upland acres we broke up the ground. It couldn't be a better patch if twenty dollars an acre had been spent on it. Ragweed, lamb's quarters, smartweed, fox tail grasses and other equally choice game bird foods are there in the profusion.

"Most birds, hunting size and otherwise," Dr. Linduska continued, "are seed eaters and the seed crop from annual weeds is Class A fodder to practically all of them. Annual weeds are always the first plants to appear on disturbed ground. So if you have an idle corner of land that's even half-way fit, you can hardly improve on the wildlife food patch that will appear if you just plow it. Some common weed seeds remain viable in the soil for fifty years or longer.

"Shrubby areas for cottontails and as ground cover for game birds can be encouraged with equal indifference and low costs. In the natural parade of plants that succeed one another on undisturbed ground, shrubs usually make their entry about ten years after the annual weed stage. But such areas have to be protected from fire, grazing, plowing and like disturbances. The process can be hastened in dense woods by removing a few trees so that the sunlight can penetrate to ground level. Along a field - woodland border, cutting back the woods for 15 or 20 feet will bring on a shrub border in jig time. Fence rows, if not plowed out, will grow up to a stage productive of pheasants, rabbits and quail in but a few years.

"Come to think of it, the old patch farms of a generation or two ago abounded in conditions of the sort we're talking about today. Maybe that's why a few who remember consider it the golden era for native game crops."

RAPID DETECTION OF PLANT VIRUS

A method of detecting plant viruses within 45 minutes has been developed, using a two per cent suspension of red blood cells. Juice extracted from the leaf or fruit tissue, combined with a phosphate buffer, is added to the suspension. Clumping of the red cells indicates the presence of virus and provides a measure of the virus concentration.

Sensitivity is high and virus indication has been found in plants long before the appearance of virus lesions. Previous methods have taken as long as a week. — PENNSYLVANIA STATE UNIVERSITY.

When To Drop An Old Product

The agronomist who has watched the great changes in the utilization of farm crops within the past generation will understand the problem faced by industry in deciding when to drop an old product and substitute a new one.

Changing consumer tastes, increased average income, and rapid strides in technology have kept both industry and agriculture busy reshaping their output to satisfy consumer demand. Du Pont has dropped scores of items from its list of about 1200 products and product lines — a comparable number of them being replaced with something newer or better. The problem is particularly serious in the chemical industry, because one of the industry's major accomplishments has been to develop new products for use in virtually every line of endeavor.

Although changes in agriculture have usually taken place over longer time periods, fall in demand has forced many major readjustments. The most glaring example is the decline in farm work animals with the growth of mechanization. In 1955, there were slightly over three million horses on the nation's farms, while 35 years earlier the number exceeded 20 million. During the same period, mules dropped from 5.6 million to 1.4 million.

Decline in Crops

Other examples of decline exist in crops and livestock. Maple sirup and sugar output, which in 1918 produced the equivalent of 52 million pounds of sugar, totalled only 14 million in 1954. Green peas declined from 9.5 million bushels in 1939 to 1.4 million in 1954. The humble cowpea produced over 8 million bushels of peas in 1941, but only 1.4 million in 1954. The slaughter of sheep and lambs was up to over 26 million animals in 1943, dropping to 24 million in 1945, and 16 million in 1954, thus reflecting the decline in consumption from 7.2 pounds per capita in 1945 to 4.5 in 1954.

Fruit has been on the decline for many years, with 1954 per capita consumption at 102 pounds, compared to 149 pounds in 1939. Apples dropped about 36 per cent, while apricot production was reduced to less than half.

Probably the most common reason for drop-

FIRE HAZARD of nitrate film, on which this movie scene was made, led Du Pont to start manufacture of acetate safety base. Chemical industry drops products when safer ones are discovered.

AROMATICS, perfumes and deodorants, long made by Du Pont, were sold to small firms when found it wasn't feasible to produce by continuous-flow method. Most aromatics are made in batches.

"CEL-O-GLASS" plastic coated wire business was sold to small firm when Du Pont found it uneconomical to improve its product. Small firm could sell it for less, still make better profit.

ping an item is obsolescence.* When Du Pont or one of its 10,000 competitors comes up with a new product that does a job better, more cheaply, or more safely, the old one usually goes into the discard. Lithopone, a white pigment, is an example. Titanium dioxide pigment was found to be "whiter" and to have better covering power in paints and the like. The old "celluloid" film (cellulose nitrate), which was highly flammable, eventually gave way to nonflammable cellulose acetate which, in its turn, is being challenged by the more durable "Cronar" polyester photographic film base.

$60 Million for Research

Du Pont spends over $60 million a year for research, which has been a major source of new products. In fact, about half the company's sales in recent years represent products that were first introduced commercially by Du Pont in the past 25 years, and which resulted from Du Pont research. The cost of introducing new products and abandoning the production facilities of old ones is reflected in the fact that the company spent $157 million for new construction last year, and more than $656 million in the past five years.

The dynamic process of product changes has been described by Crawford H. Greenewalt, President of Du Pont, in these words: "Roughly speaking, you could compare Du Pont with a flexible barrel that has an open top and a spigot at the bottom. Research produces a flow of new materials into the top. While they are flowing in, however, products and processes that have been made obsolete by new and better ones are drained from the spigot at the bottom. A reasonable flow at both ends keeps the company vital and healthy."

**In the case of agricultural products many factors affect changes in output, including tastes, disease, loss of fertility, and high production costs.*

CHEMICAL KILLS CABBAGE CLUBROOT

VPM soil fumigant, applied 14 days after transplanting, will control clubroot in cabbage and cauliflower. One quart of the chemical in 15 gallons of water is applied per 100 square feet, followed immediately with another 5 to 10 gallons of water. This treatment will also control weeds in the application area. — NEW YORK EXPERIMENT STATION.

Cotton Seedling Disease Control

Ten fungicides were tested separately and in certain combinations when applied in the furrow as possible protectants against the cotton seedling disease complex. The pathogens were mixed with the seed and placed in the seed furrow at planting time to insure the close proximity of the disease incitant to the seed and developing seedling, and to place each fungicide tested in a more uniform pathogen-host sphere.

Four replicated plots, non-inoculated and inoculated with a group of fungal cultures known to be seedling disease incitants, were tested over a two-year period. The fungicide treatments captan, nabam,* PCNB plus nabam, and nabam plus zinc sulfate gave higher plant populations that produced yields more than two-fold that of the untreated plots. Significant differences in yield at first picking followed by significantly larger total yield increases were obtained. Highly significant differences were noted in the reduction of nubroot symptoms.

Significant Yield Differences

In the 1956 experiment the fungicide treatments gave increased stands that carried through to yields more than two-fold that of the untreated plots. The differences obtained in the 1955 test for nabam, nabam plus zinc sulfate, and nabam plus PCNB were of the same magnitude and closely correlate with those obtained in the 1956 season.

The significant differences in yield at first picking are of economic consideration. Apparently the plants were given an advantage at the period of early growth. This early healthy start apparently promoted early fruiting and allowed the plant to produce a larger percentage of the crop at the first picking, when quality and prices are higher. Another factor in maturity is the fact that cotton fruits earlier when the populations are higher.

All plants in the 1956 tests were pulled after harvest to check root development. Highly significant differences in root development were noted in both the inoculated and uninoculated tests. — MISSOURI AGRICULTURAL EXPERIMENT STATION.

**DuPont manufactures "Parzate" liquid nabam fungicide.*

CAGES RAISE EGG PRODUCTION

A study of production differences among two groups of about 500 laying hens in a cage house and a floor unit showed the following results:

1. Initial cost for entering each type of operation will vary; however the average initial cost per bird will be about 75 cents more per bird in cages than in the floor unit.

2. In order to keep the cage unit to full capacity, replacements must be started every other month or at regular intervals.

3. The cage unit will result in more uniform egg production throughout the year. This uniformity is highly desirable for the over-all industry.

4. Eight-inch cages will give equal results to ten-inch cages for the Leghorn type bird. This reduction in cage size will result in an increase of 252 more cages in a 1000-capacity house.

5. The over-all mortality was less in cages than on the floor.

6. It took slightly less pounds of feed to produce a dozen eggs in cages than on the floor.

7. Labor income for the first year's operation was in favor of cages. — MISSISSIPPI AGRICULTURAL EXPERIMENT STATION.

PLASTIC BAGS IN CREAM MARKETING

Using plastic bags instead of cans for the marketing of cream improves quality, decreases overhead costs, saves shipping space and weight, and permits use of smaller trucks. Four 10-pound plastic bags have the equivalent of a five-gallon cream can but take up only half as much space.

Furthermore, the weight of the empty bags and the corrugated paper box in which they are shipped is only 2.5 pounds, compared to the 14 pounds of the average five-gallon can. Plastic bags eliminate can washing and handling, requiring less labor, as well as less equipment and suplies. — SOUTH DAKOTA STATE COLLEGE.

FLY CONTROL OF DAIRY CATTLE

A chemical formulation containing methoxychlor and "Co -" fly repellent knocked out up to 83 per cent of the stable flies on the first day of spraying. In tests, cattle were sprayed after the morning milking at weekly intervals from late June to the end of August. Because the effectiveness of the formulation on stable flies dropped rapidly after the second and third days, it is suggested that dairy cattle be sprayed twice a week where biting flies are a summer problem. — UNIVERSITY OF MINNESOTA.

CONTROL OF LETTUCE DOWNY MILDEW

The Everglades area of Florida appears well suited for lettuce production. The rich muck soils with their controllable water tables, plus the low rainfall and cool weather from December to April, provide good conditions for growth and head formation. Nevertheless, lettuce plays a minor role in the agriculture of the area because of the difficulty of producing a crop and poor keeping qualities in transit. Influencing both of these factors are a number of diseases, one of the most important being downy mildew **(Bremia lactucae).**

During periods of cold, wet weather, downy mildew can be devastating, forcing complete abandonment of extensive acreages. Under less severe conditions, quality is impaired through destruction of the lower (wrapper) leaves and subsequent reduction in leaf size. Efforts on the part of growers to control the disease have not been satisfactory.

Tests were run in 1955 and 1956 with several fungicides. Excellent control of lettuce downy mildew was obtained over a two-year period with zineb (zinc ethylene bisdithiocarbamate) and during one year with maneb (manganese ethylene bisdithiocarbamate). Other materials were either less effective or were objectionable because of phytotoxicity. —EVERGLADES EXPERIMENT STATION, UNIVERSITY OF FLORIDA.

LIQUID CHEMICAL LESS HAZARDOUS

Studies were made in 1947 and in 1956 to determine the atmospheric mercury concentration in establishments treating seed grain with disinfectants. A comparison of the results reveals a substantial reduction in concentration during 1956. This can be attributed to a considerable extent to the change in method from dry to liquid treating. An evaluation of the average of .03 milligrams of mercury per cubic meter of air on a time-concentration basis suggests that the exposure compares favorably with the limit of .01 mg. adopted by the American Conference of Industrial Hygienists as the limit that should not be exceeded for exposure of eight hours per day, day after day, since in most establishments the treating time probably does not exceed one-third of the working day. — MINNESOTA STATE DEPARTMENT OF HEALTH.

SOIL PHOSPHORUS REDUCES BLOAT

Adequate supplies of soil phosphorus may help eliminate bloat in farm animals. Some legumes build up chemical compounds that have been identified with certain types of bloat if the phosphorus supply is low in relation to the supply of nitrogen. — SOUTH CAROLINA EXPERIMENT STATION.

PROTEIN INCREASES PIG GROWTH RATE

A slight difference in the percentage of protein in a swine ration goes a long way toward determining the margin of profit from market pigs, on the basis of experiments with two groups of pigs fed different protein levels.

One group received a 16 per cent crude protein ration from 50 up to 150 pounds and a 14 per cent protein ration from 150 to 200 pounds. The other group received a 14 per cent protein ration from 50 to 100 pounds and a 12 per cent ration from 100 to 200 pounds. At the end of the test, the pigs on the "high protein" ration had gained 1.57 pounds per day and the other group had gained only 1.37 pounds per day. Pigs on the "low protein" ration consumed 73 pounds more feed than the other group. Feed costs for the test period were $15.45 per pig for those on the "high protein" ration and $17.70 for those on the "low protein" ration. — OKLAHOMA AGRICULTURAL EXPERIMENT STATION.

WEED CONTROL IN SEED ONIONS

A cooperative study conducted by the USDA and the Utah Station over a five-year period has shown that onion seed growers can reduce, or even eliminate, most of the mechanical and hand methods of controlling annual broadleaved weeds and grasses in an onion seed crop by the use of chemical herbicides.

Monuron* was the most satisfactory herbicide tested. It was the only material which could be safely applied in the spring at the time of planting mother bulbs, and it was also one of the few chemicals that could be used at the time the onion stalks were beginning to elongate. At either time, two pounds of monuron per acre in 80 gallons of water proved effective. — UTAH AGRICULTURAL EXPERIMENT STATION.

*"*Karmex*" *monuron herbicide is made by DuPont.*

FERTILIZER AIDS ORNAMENTALS

Fertilizer can be used to push the growth of young shade and ornamental trees where quick development is desired. In transplanting a young tree, fertilizer should be used sparingly and should never be placed where it will come in direct contact with the roots. Once a tree is established, fertilizer will help it grow.

When a tree has been injured or attacked by insects or diseases, or if it shows symptoms of general loss of vigor, fertilizer can be used to help it recover. Two pounds of a complete chemical fertilizer for each inch of trunk diameter is the minimum that should be applied. More can be used in many situations — UNIVERSITY OF CALIFORNIA, BERKELEY.

CHEMICALS CAN PRE-DIGEST FORAGE

Methods are now available to treat forage plants to make them digestible by one-stomach animals, such as pigs, horses, and poultry. Treatment includes use of chemicals, enzymes, mechanical softening or disintegration, and fermentation with microorganisms such as those found in the cattle rumen. Further research in this field offers exceptional promise of expanding the use of these feed crops and substitution of soil-saving crops for surplus grain on a substantial acreage. — COMMISSION ON INDUSTRIAL USE OF AGRICULTURAL PRODUCTS.

Effect of Chemicals on Future Agricultural Technology

By DALE E. WOLF, Ph. D.*
Grasselli Chemicals Department
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For a good many years the chief impact of agricultural chemicals on the agricultural engineering profession has been the demand for equipment which would place these chemicals where they are needed to do the job. Until recently, there has not been much indication that chemicals would demand any revolutionary concepts in the application of agricultural engineering in the production of crops, livestock, or poultry.

For example, we have always taken it for granted that certain crops should be sown in rows. So, all the machinery used from the breaking of the land right through harvest has been designed for row culture. Probably the original reason for row culture was to provide space betwen the plants so that a man could walk through and hoe out the weeds. Now, however, chemical weed control has progressed to such an extent that the day may not be far off when crops will come through the entire season without any weed control operation being necessary. Then, it may be more productive to sow what we now call row crops in some other pattern. And perhaps instead of row pickers for crops like corn and cotton we will have combines as we now have for so many crops which are sown broadcast.

Impact of Chemical

In the control of insects and plant diseases, we are moving more and more toward the concept of systemic protection, which is really the creation of immunity by chemicals. We hope to see the day when we can treat seed or young plants once to obtain protection for the entire season. This, of course, will be a radical departure from the present day concept that you have to have sprayers or dusters and go over the fields frequently during the growing season to keep new growth protected.

In fertilization, there is the application of fertilizers in soluble form in irrigation water. Even in the humid areas of the southeast, farmers are coming to depend more and more on a controlled water supply through irrigation rather than the haphazard rainfall supplied by nature. Application of fertilizer in irrigation water is highly efficient, and the rate of feeding various elements can be regulated to fit the exact stage of growth of the crop.

Redesigned Equipment

Many of the chemicals which we would like to use for soil treatment are quite expensive. Therefore, we want to treat as small a portion of a field as possible and prolong the effect of the treatment as long as necessary. Here we are still in the row culture phase. To control fusarium root-rot in tomatoes, for example, we are experimenting with treatment of a 12-inch band of soil straddling the tomato row in the field. Once that band of soil is treated we want to be sure that that treated soil remains undisturbed in contact with the roots of the tomato plant for as much of the season as possible. If we treat the soil at planting time, the normal operations of opening up the planting row and then bringing the soil back around the base of the plant or over the seed dilutes the effectiveness of the chemical treatment. In fact it may introduce new contamination. So in order to get the greatest effect from the chemical treatment of soil, we may have to redesign some planting equipment so it does not move the soil around too much.

In livestock and poultry, the effect of chemicals on engineering probably cannot be separated from many other advancements which are taking place; here, too, we have seen only the beginning. The use of nutritional supplements and medicines in feed has made it more and more possible to regard herds and flocks as living factories for the production of meat, milk, and eggs. Especially in the production of milk and eggs, we have seen revolutionary changes in the buildings and equipment in recent years. The pen stable and milking parlor management of a dairy herd is considerably different from the old stanchion-type of dairy barn. Batteries of laying hens in cages seem to promise many flock management advantages over older methods. Broiler production perhaps comes closest of any agricultural operation to the pattern of industry.

* *Excerpts from an address before the North Atlantic Section, American Society of Agricultural Engineers, University of Delaware, Newark, August 27, 1957.*

Farmers Ask About . . . .

Q: How many types of useful plants are cultivated in the United States?

A: Exclusive of ornamentals, about 150 species are cultivated for food, fiber, and industrial uses. Some 90 of these crops have an annual value of $1 million or over.

* * * * *

Q: Is irrigation contributing to the increase in animal parasites?

A: Yes. According to the Department of Agriculture, extension of irrigation "will create a situation favorable to the unimpeded march of livestock parasites."

* * * * *

Q: How much has average milk production increased recently?

A: In the past 10 years, it has risen 20 per cent, with the 1956 average at 6,000 pounds per cow.

* * * * *

Q: How much money is spent by non-governmental organizations for agricultural research?

A: Industry and other private sources contribute about $185 million per year to agricultural research spending.

* * * * *

Q: How can milk fever be prevented in high-producing cows?

A: Feeding of one pound of vitamin D supplement for each of six days before calving will prevent milk fever, according to K. E. Harshbarger, University of Illinois. Such feeding should not exceed seven days, since the effect of longer feeding may be harmful.

* * * * *

Q: Does molybdenum supplementation inprove poultry feed?

A: Research at the Texas A. & M. College showed that addition of small amounts of molybdenum produced 15 per cent greater growth in chickens, by enabling the birds to utilize their feed better.

* * * * *

Q: How much work does it take to provide the average farm with water?

A: On a typical farm it takes an average of 773 hours per year to draw and carry the 33,000 gallons of water needed. With a flexible pipe installation, the work can be cut to about one-seventh, or 110 hours.

* * * * *

Q: Is it true that farmers suffer less than city people from headaches?

A: Yes, according to a report from the Louisiana State University Medical School, which found that 50 per cent of farmers get headaches, as compared to a 60 per cent average for the population as a whole. The rate for business executives is 77 per cent; for professional people, 70 per cent; for housewives, 69 per cent; and 55 per cent for manual laborers.

* * * * *

Q: Is it true that meat consumption is higher in Australia and some South American countries?

A: Not really. Although their meat consumption is about 200 pounds per capita annually, compared to our 164, considerably higher U. S. consumption of fish, poultry, and eggs brings the total of animal proteins to nearly 250 pounds.

* * * * *

Q: How far east has the alfalfa weevil travelled?

A: An adult weevil has recently been found in Connecticut. The pest, first found in Utah in 1907, has spread over many of the Rocky Mountain and Pacific states. An infestation was found five years ago in Maryland and, since, in New York and New Jersey.

* * * * *

Q: What is the farmers' annual veterinary bill?

A: About $170 million, according to the American Veterinary Medical Association, which states that resulting savings to farmers amounted to almost $1 billion.

* * * * *

Q: How widespread is artificial insemination in breeding dairy cattle?

A: One-fourth of the nation's dairy cows were bred by artificial insemination in 1956, reports the USDA.

BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

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